

IN THE CLAIMS

1. (currently amended) A method for detecting ~~the~~ a magnetic flux, ~~the~~ a rotor position and/or ~~the~~ a rotational speed of ~~the~~ a rotor in a single- or multi-phase permanent magnet motor or -synchronous motor or -generator using the stator voltage equations:

$$\text{Equation (1)} \quad L \cdot \dot{i}_\alpha = -R \cdot i_\alpha + p \cdot \omega \cdot \psi_{m\beta} + u_\alpha$$

$$\text{Equation (2)} \quad L \cdot \dot{i}_\beta = -R \cdot i_\beta - p \cdot \omega \cdot \psi_{m\alpha} + u_\beta$$

in which

L	is the inductance
$i_\alpha$	<del>the</del> a current in the direction $\alpha$
$i_\beta$	<del>the</del> a current in the direction $\beta$
$\dot{i}_\alpha$	<del>the</del> a derivative with respect to time of the current in the direction $\alpha$
$\dot{i}_\beta$	<del>the</del> a derivative with respect to time of the current in <del>the</del> direction of $\beta$
R	<del>the</del> an ohmic resistance
p	<del>the</del> a pole pair number
$\omega$	<del>the</del> a rotational speed of the rotor
$\psi_{m\alpha}$	<del>the</del> a magnetic flux in the direction $\alpha$
$\psi_{m\beta}$	<del>the</del> a magnetic <del>flux</del> <u>flux</u> in the direction $\beta$
$u_\alpha$	<del>the</del> a voltage in direction $\alpha$
$u_\beta$	<del>the</del> a voltage in the direction $\beta$

wherein the evaluations, ~~the~~ energy conditions of ~~the~~ said rotor (2) are also taken into account.

2. (currently amended) A The method according to claim 1, wherein the said energy conditions in the a magnet (5) of the said rotor (2) are taken into account by way of the following energy equations of the rotor:

$$\text{Equation (3)} \quad \dot{\psi}_{m\alpha} = -p \cdot \omega \cdot \psi_{m\beta}$$

$$\text{Equation (4)} \quad \dot{\psi}_{m\beta} = p \cdot \omega \cdot \psi_{m\alpha}$$

wherein

$\dot{\psi}_{m\alpha}$  is the derivative with respect to time of  $\psi_{m\alpha}$  and  
 $\dot{\psi}_{m\beta}$  the derivative with respect to time of  $\psi_{m\beta}$ .

3. (currently amended) A The method according to ~~one of the preceding claims,~~ claim 1, wherein the motor model defined by the equations (1) to (4) is corrected in dependence on a comparison between computed model values (^) and measured electrical and/or mechanical values by way of at least one correction term (9), so that there results the following equations:

$$\text{Equation (1a)} \quad L \cdot \dot{i}_\alpha = -R \cdot i_\alpha + p \cdot \omega \cdot \psi_{m\beta} + u_\alpha + v_{1\alpha}$$

$$\text{Equation (2a)} \quad L \cdot \dot{i}_\beta = -R \cdot i_\beta - p \cdot \omega \cdot \psi_{m\alpha} + u_\beta + v_{1\beta}$$

$$\text{Equation (3a)} \quad \dot{\psi}_{m\alpha} = -p \cdot \omega \cdot \psi_{m\beta} + v_{2\alpha}$$

$$\text{Equation (4a)} \quad \dot{\psi}_{m\beta} = p \cdot \omega \cdot \psi_{m\alpha} + v_{1\beta}$$

in which  $v_{1\alpha}, v_{1\beta}, v_{2\alpha}, v_{1\beta}$  are correction terms

4. (original) A The method according to claim 3, wherein the measured electrical values are the motor currents.

5. (currently amended) A The method according to ~~one of the preceding claims,~~ claim 1, wherein the correction terms (9) are in each case formed from a correction factor and the difference between measured and computed motor currents.

6. (currently amended) A The method according to ~~one of the preceding claims,~~ claim 4, wherein the correction terms (9) in the equations (3a) and (4a) in the one phase are formed by way of the difference between measured and computed currents of the other phase, wherein the correction term is introduced into equation (3a) with a negative polarity.

7. (currently amended) A The method according to ~~one of the preceding claims,~~ claim 1, wherein the said rotational speed is detected sensorically.

8. (currently amended) A The method according to ~~claims~~ claim 7, wherein the said rotational speed is determined with the help of a Hall sensor.

9. (currently amended) A The method according to ~~one of the preceding claims,~~ claim 1, wherein the said rotational speed is evaluated by calculation in a manner such that the a difference between the flux speed and an assumed rotor speed or variables derived therefrom is formed as a rotational speed correction term (11) and the actual ~~{current}~~ rotational speed is evaluated by way of an approximation process.

10. (currently amended) A The method according to claim 9, wherein the said rotational speed correction term (11) is corrected by way of a rotational speed measurement.

11. (currently amended) A ~~The~~ method according to ~~one of the preceding claims, claim 1~~, wherein the assumed rotor rotational speed by way of a rotational speed correction term (11) is adapted in an adapter block (10) to the actual [current] rotational speed.

12. (currently amended) A ~~The~~ method according to ~~one of the preceding claims, claim 1~~, wherein the assumed rotational speed by way of a rotational speed correction term (11) is adapted in a rotational speed model to the actual rotational speed.

13. (currently amended) A The method according to ~~one of the preceding claims, claim 3~~, wherein for evaluating the flux speed one determines the position of the magnetic flux and specifically by way of the equation

$$\text{Equation} \quad (5) \quad \rho = \frac{1}{p} \cdot \text{Arctg} \left( \frac{\psi m \beta}{\psi m \alpha} \right)$$

14. (currently amended) A The method according to claim 13, wherein the equation (5) is differentiated with respect to time and the equations (3a) and (4a) (for calculated evaluation of the rotational speed) are substituted into the differentiated equation (5).

15. (currently amended) A The method according to claim ~~12~~, 1, wherein in the rotational speed model the derivative with respect to time, preferably of the first order, of the rotational speed is used.

16. (currently amended) A The method according to ~~one of the preceding claims~~, claim 1, wherein the rotational speed model is formed by a mechanical condition equation preferably of the form:

$$\text{Equation (8)} \quad \dot{\omega} = \frac{1}{J} \cdot (M - M_L),$$

M is the driving moment,

M<sub>L</sub> a load moment, and

J a moment of inertia of the rotating load.

17. (original) A The method according to claim 16, wherein the load moment is set to zero.

18. (original) A The method according to claim 17, wherein the drive moment is set to zero.

19. (currently amended) A The method according to ~~one of the preceding claims~~, claim 1, wherein the load moment is formed by

$$\text{Equation (11)} \quad M_L = K_1 \cdot \omega^2,$$

in which  $K_1$  is a constant.

20. (currently amended) A The method according to ~~one of the preceding claims~~, claim 1, wherein the drive moment is defined by

$$\text{Equation (10)} \quad M = K_2 \cdot (\psi_{m\alpha} \cdot i_\beta - \psi_{m\beta} \cdot i_\alpha),$$

in which  $K_2$  is a constant.

21. (newly added) A motor system comprising:

a rotor;

a stator;

a control for detecting a magnetic flux, a rotor position and/or a rotational speed of said rotor in a single- or multi-phase permanent magnet motor or -synchronous motor or -generator using the stator voltage equations:

$$\text{Equation (1)} \quad L \cdot \dot{i}_\alpha = -R \cdot i_\alpha + p \cdot \omega \cdot \psi_{m\beta} + u_\alpha$$

$$\text{Equation (2)} \quad L \cdot \dot{i}_\beta = -R \cdot i_\beta - p \cdot \omega \cdot \psi_{m\alpha} + u_\beta$$

in which

$L$  is the inductance

$i_\alpha$  a current in the direction  $\alpha$

$i_\beta$  a current in the direction  $\beta$

$\dot{i}_\alpha$  a derivative with respect to time of the current in the direction  $\alpha$

$\dot{i}_\beta$  a derivative with respect to time of the current in the direction of  $\beta$

$R$  an ohmic resistance

$p$  pole pair number

$\omega$  a rotational speed of the rotor

$\psi_{m\alpha}$  a magnetic flux in the direction  $\alpha$

$\psi_{m\beta}$  a magnetic ~~flux~~ flux in the direction  $\beta$

$u_\alpha$  a voltage in direction  $\alpha$

$u_\beta$  a voltage in the direction  $\beta$

wherein the evaluations, an energy conditions of the rotor are also taken into account.

22. (newly added) The motor system according to claim 21, wherein said energy conditions in a magnet of said rotor are taken into account by way of the following energy equations of the rotor:

$$\text{Equation (3)} \quad \dot{\psi}_{m\alpha} = -p \cdot \omega \cdot \psi_{m\beta}$$

$$\text{Equation (4)} \quad \dot{\psi}_{m\beta} = p \cdot \omega \cdot \psi_{m\alpha}$$

wherein

$\dot{\psi}_{m\alpha}$  is the derivative with respect to time of  $\psi_{m\alpha}$  and  
 $\dot{\psi}_{m\beta}$  the derivative with respect to time of  $\psi_{m\beta}$ .

23. (newly added) The motor system according to claim 21, wherein the motor model defined by the equations (1) to (4) is corrected in dependence on a comparison between computed model values (^) and measured electrical and/or mechanical values by way of at least one correction term (9), so that there results the following equations:

$$\text{Equation (1a)} \quad L \cdot \dot{i}_\alpha = -R \cdot i_\alpha + p \cdot \omega \cdot \psi_{m\beta} + u_\alpha + v_{1\alpha}$$

$$\text{Equation (2a)} \quad L \cdot \dot{i}_\beta = -R \cdot i_\beta - p \cdot \omega \cdot \psi_{m\alpha} + u_\beta + v_{1\beta}$$

$$\text{Equation (3a)} \quad \dot{\psi}_{m\alpha} = -p \cdot \omega \cdot \psi_{m\beta} + v_{2\alpha}$$

$$\text{Equation (4a)} \quad \dot{\psi}_{m\beta} = p \cdot \omega \cdot \psi_{m\alpha} + v_{1\beta}$$

in which  $v_{1\alpha}, v_{1\beta}, v_{2\alpha}, v_{1\beta}$  are correction terms

24. (newly added) The motor system according to claim 23, wherein the measured electrical values are the motor currents.

25. (newly added) The motor system according to claim 23, wherein the correction terms (9) are in each case formed from a correction factor and the difference between measured and computed motor currents.

26. (newly added) The motor system according to claim 23, wherein the correction terms (9) in the equations (3a) and (4a) in the one phase are formed by way of the difference between measured and computed currents of the other phase, wherein the correction term is introduced into equation (3a) with a negative polarity.

27. (newly added) The motor system according to claim 21, wherein said rotational speed is detected sensorically.

28. (newly added) The motor system according to claim 27, wherein said rotational speed is determined with the help of a Hall sensor.

29. (newly added) The motor system according to claim 21, wherein the rotational speed is evaluated by calculation in a manner such that a difference between the flux speed and an assumed rotor speed or variables derived therefrom is formed as a rotational speed correction term (11) and the actual rotational speed is evaluated by way of an approximation process.

30. (newly added) The motor system according to claim 29, wherein the said rotational speed correction term (11) is corrected by way of a rotational speed measurement.

31. (currently amended) The motor system according to claim 21, wherein the assumed rotor rotational speed by way of a rotational speed correction term (11) is adapted in an adapter block to the actual [current] rotational speed.



32. (newly added) ) The motor system according to claim 21, wherein the assumed rotational speed by way of a rotational speed correction term (11) is adapted in a rotational speed model to the actual rotational speed.

33. (newly added) The motor system according to claim 33, wherein for evaluating the flux speed one determines the position of the magnetic flux and specifically by way of the equation

$$\text{Equation (5)} \quad \rho = \frac{1}{p} \cdot \text{Arctg} \left( \frac{\psi m \beta}{\psi m \alpha} \right)$$

34. (newly added) The motor system according to claim 21, wherein the equation (5) is differentiated with respect to time and the equations (3a) and (4a) (for calculated evaluation of the rotational speed) are substituted into the differentiated equation (5).

35. (newly added) The motor system according to claim 21, wherein in a rotational speed model is used comprising a derivative of the first order with respect to time.

36. (newly added) The motor system according to claim 35, wherein a rotational speed model is formed by a mechanical condition equation preferably of the form:

$$\text{Equation (8)} \quad \dot{\omega} = \frac{1}{J} \cdot (M - M_L),$$

M is the driving moment,

M<sub>L</sub> a load moment, and

J a moment of inertia of the rotating load.

37. (newly added) The motor system according to claim 36, wherein the load moment is set to zero.

38. (newly added) The motor system according to claim 37, wherein the drive moment is set to zero.

39. (newly added) The motor system according to claim 21, wherein the load moment is formed by

$$\begin{array}{ll} \text{Equation(11)} & M_L = K_1 \cdot \omega^2, \\ \text{in which } K_1 & \text{is a constant.} \end{array}$$

40. (newly added) The motor system according to claim 21, wherein the drive moment is defined by

$$\begin{array}{ll} \text{Equation (10)} & M = K_2 \cdot (\psi_{m\alpha} \cdot i_\beta - \psi_{m\beta} \cdot i_\alpha), \\ \text{in which } K_2 & \text{is a constant.} \end{array}$$